SIMPRESS
Knowledge Capture and Sharing – A Powerful Competitive Advantage

Dr Victor Pantano & Professor Michael Cardew-Hall, *Department of Engineering, Australian National University*

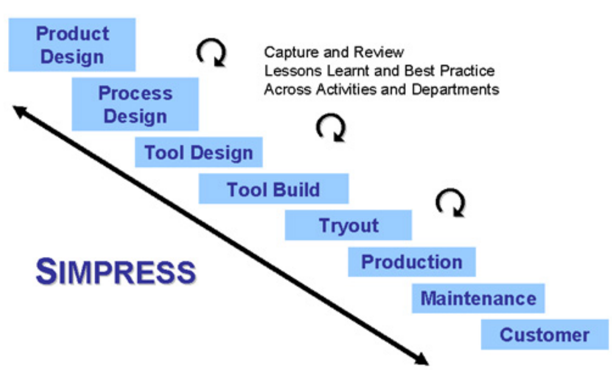
Automotive news pages these days are populated with numerous stories of OEMs and suppliers engaged in greater global sourcing from fast growing, low wage economies such as India and China. The stories are similar across all manufacturing sectors; developed high wage economies are finding it increasingly difficult to compete on cost. One approach cited to counter this is to innovate and increase the rate of technology transfer. Government policy often supports this approach through the creation of a 'knowledge economy' - designed to promote the generation of high value-add knowledge, technology and associated skills.

Fast growing economies, particularly those of India and China, may be further back along the learning curve relative to western economies such as in Europe and North America, but this will not always be the case. Indeed, both countries have open aspirations to move beyond simple low cost, high volume manufacture to cover the full knowledge cycle: research, design, development and manufacture. Only in this way can both India and China sustain predicted economic growth to move within the top three world economies by 2050.

The 'knowledge economy' relies on two vital components: the generation of knowledge/technologies followed by application or implementation. In a manufacturing context this implementation usually takes place on the shop floor - the 'coalface'. It is here that innovation and technology transfer often breaks down, particularly within developed manufacturing economies, which suffer from a high cultural, behavioural and attitudinal inertia. Unfortunately this is something that is not too often talked about. Certainly we read about the generation of new ideas, new processes and new technologies but we rarely hear about their application. Intuitively this may be because we in the manufacturing sector understand the difficult conditions at the 'coalface', but crucially, what we fail to understand is that in places like India, these difficult conditions are somewhat non-existent.

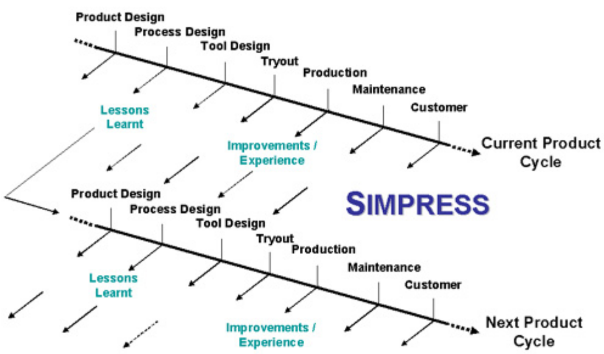
Context and Technology

First-hand experience of this difference was gained on an implementation project within a global automotive OEM. Based predominantly in the Asia-Pacific, the Knowledge Management System (KMS) was designed and then implemented within its Australian and Indian stamping facilities.



Capture knowledge across whole process

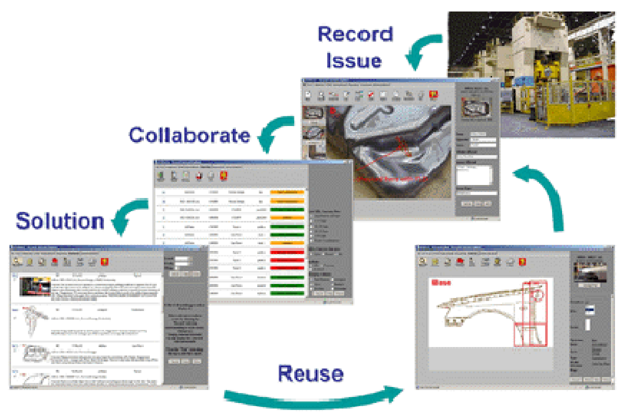
The impetuses behind the system's development were many and varied. Previous downsizing had resulted in a loss of valuable 'know-how' within the stamping area of the organisation which had threatened new product launch deadlines and increased development cost. The organisation wanted to capture downstream manufacturing knowledge (within the tooling, stamping and assembly areas) and feed this back to engineering, product development and design. In doing so, this would allow early rectification of potential manufacturing problems at the design/engineering stage and was seen to be particularly valuable in fixing expensive tooling issues that recur on a model-to-model basis. The system would also serve as a repository for shop floor generated improvement ideas, recognising the expertise which exists amongst manufacturing personnel who deal with tools and processes on a daily basis.



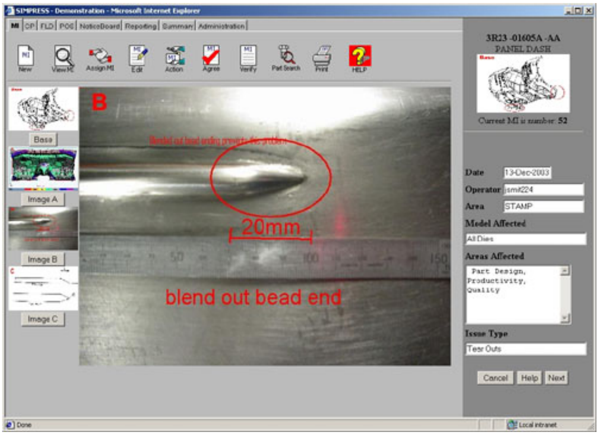
Use of SIMPRESS for Continuous Improvement

The development of a part and tool specific KMS could also be used by the company to train future generations of toolmakers and production operators. Moreover, as well as acting as a shop floor resolution instrument, the system would contain detailed part and die histories which would form the basis of a valuable design, simulation and engineering tool for future model development. Part of the attraction for the relatively young Indian manufacturing operation was that it would assist the technology transfer, improving their local capability and making them part of the global operation of the company. Further, as design and development for the Asia-Pacific was becoming centralised within Australia, the system would act as a regional knowledge base allowing Indian manufacturing operators to communicate directly with Australian designers and engineers.

The resultant manufacturing KMS known as SIMPRESS was developed and implemented within the Australian operation over a period of a year. The system is web-based and resides on the company intranet making it accessible globally but with individually controlled access rights and permissions. The company wanted to ensure knowledge capture at source, meaning target input users would be shop floor operators, supervisors and manufacturing middle management. Owing to the sometimes minimal computer literacy which exists in this target user group, the system was designed to allow entry in five simple 'wizard' type steps. Minimal entry time was a critical requirement in a high volume manufacturing context and as such, 5 - 10 minutes was required for a typical entry.



The SIMPRESS Process



System interface

The system itself is totally visual in nature and supports a hierarchy of images and accompanied text. This is different to most other systems which support the more common format of text with accompanying image. Thus, when making an entry, the user is asked to mark-up a CAD image of the part and then prompted to add digital images of the subject part/tool/assembly which they can then also mark-up and annotate. All the tools needed to do this are contained within the web-browser. This feature significantly reduces the amount of text description required and makes the entry timeless – it is like having the part/tool/assembly in front of you.

The initial version of the system contained two modules to support the launch of new model programmes within each of the manufacturing subsidiaries. Both of these act to integrate new and existing work processes, allowing the user to capture concerns, resolutions and improvements associated with new parts and tooling. The system then deploys a communication backend sending the entry to an area controller. After assessing the entry for appropriateness and accuracy, the controller escalates the entry to upstream engineering, product development and design areas for actioning and integration. The designated assignee is able to collaborate with multiple people from various areas to decide on how best to address the concern and incorporate its outcomes into best practice. After senior management approval the entry is sent back to the originator with associated feedback. At all times the user is kept informed of progress (through an electronic ‘Noticeboard’) indicating that their input and knowledge is a valued organisational asset.

Implementation Differences

The system was originally launched within the Australian manufacturing operation. It’s visual nature and easy to use interface made the adoption of the system much easier than a purely text based solution. In addition, the system was integrated into the existing production system so that it became a seamless extension to the user. After having launched the system within the Australian manufacturing operation, the interface was slightly modified and a similar implementation was undertaken on the Indian shop floor. The differences were significant and in terms of transfer ease and adoption, clearly in favour of the Indians. The Australian manufacturing context is traditional in nature with an associated culture of inertia to change. This makes new technology introduction highly political, bureaucratic and overly complex. It was found that the Indians are not burdened with the same baggage and are relative newcomers to western philosophies of organisation and manufacturing and seemed to adopt the system implementation more readily.

The culture and motivation for the Indian shop floor operator within a transplanted plant is different to their western counter part. This is somewhat understandable given the primitive conditions experienced by workers in indigenous manufacturing operations, where there is no communication, workers are not allowed to talk with superiors and hierarchy is entrenched. Indian workers appreciate the communication and openness between management and the shop floor and the ability to be able to discuss and participate regardless of title and rank. For example, Indian operators feel a sense of esteem when they are able to talk to the manufacturing vice president on the shop floor and even more so when he/she talks to them. In western manufacturing operations this engagement and inclusiveness, which Indian counterparts value, is often treated with scepticism, antipathy and indifference.

The average age of the manufacturing workforce in the Indian subsidiary is around 30 years. They are all highly educated, holding at least a bachelor degree and most with masters. Even the operators moving parts between presses or handling the manual spot welders (in the sometimes over 50^{o}C summer heat) are all educated to bachelor degree and/or masters level. A high proportion of operators spend 12 hours a day at work (including travelling to and from), and then a further 3 - 4 hours at night studying at local colleges or universities. This commitment not only underscores the desire for personal achievement and improvement, but also the intellectual capacity of the shop floor workforce.

The motivators which drive such commitment are many and varied. On a broader social scale poverty is widespread. Many of the male shop floor operators are bound to provide for not only their own family but that of their siblings and parents. Foreign organisations pay well compared to local companies and thus they are pressured to not only maintain their jobs but develop and prosper. Western organisational philosophies offer a structure and associated processes to achieve this. Noticeably however, one common element of a western manufacturing organisation – a workers union, was not present. A small group of operators had previously tried to organise a union but they suffered from a lack of colleague support. Indians have seen what they term the 'destructive' effects of unions in other manufacturing workplaces and furthermore are satisfied with management and their working conditions. Perhaps also, they intuitively understand the large number of people waiting to fill their position and as such, feel a strong sense of privilege.


t

Timely knowledge capture at source

More than anything however, when working with the Indian operators one feels an overwhelming sense of hunger: a hunger to do better, a hunger to learn, a hunger to develop, a hunger to succeed. They are extremely enthusiastic to learn new things and apply them in their work. They feel a sense of pride in the organisation and they understand that their success is inextricably tied to the success of the organisation. Because of this there is a sense of team which drives enthusiasm and individual contribution. The tool maintenance team aids the production team to overcome rate issues without being prompted or told to do so. Operators speak of being 'proud' to contribute and feeling 'honoured' when they are recognised by a peer among a group of workmates. It is these cultural, social and attitudinal characteristics which make technology transfer a somewhat simpler and less daunting proposition.

The Bottom Line

So what does this mean for the 'knowledge economy' and government policies which aim to encourage the introduction and application of technology to fight off threats from fast developing, low wage economies? Current attention is focused on the generation side of the 'knowledge economy', but without associated swift application, these policies will most likely fail. Those who reason that manufacturing sectors in countries such as India and China do not have the skills or experience to match their counterparts in western countries are correct. They are however, supporting perhaps a short sighted argument as such countries have the capacity to catch, match and eventually surpass the west in many areas of manufacturing.

Finding a solution to this problem is very difficult. Western manufacturing needs to understand and acknowledge the threat they are facing, in particular those at the 'coalface' and their associated management. The often prevalent "them versus us" mentality promotes a separatist attitude which not only hampers technology transfer before it starts, but prevents the everyday activities which underpin world class manufacturing (continuous improvement for example). Changing over a hundred of years of industrial tradition and culture is an immense task. It takes time, persistence and effort from all stakeholders: government, education and industry. As such, we must start the journey now. One approach is as outlined here, by adopting a system which provides a mechanism to capture knowledge and information during the design-manufacture process and feed that back into addressing issues with designs and processes. In the first instance this has the potential to save money immediately, but perhaps more importantly, the implementation of the system becomes a vehicle for change in the organisation. Individuals begin to feel that their knowledge is valued. They become involved in creating a legacy for the future prosperity of the organisation. What is clear is that failing to arrive or arriving too late could result in some costly and undoubtedly much disliked consequences.